

A 157
E6
919
copy 1

ENGINEERING COUNCIL, New York

29 W. 39th Street, New York

**COMMITTEE ON CLASSIFICATION
AND
COMPENSATION OF ENGINEERS**

**PRELIMINARY REPORT OF FEDERAL
GOVERNMENT SECTION**

NOVEMBER, 1919

ENGINEERING COUNCIL

29 WEST 39th STREET, NEW YORK

Telephone, Vanderbilt 4600

An organization of National Technical Societies of America, created to provide for consideration of matters of common concern to Engineers, as well as those of public welfare in which the Profession is interested, in order that united action may be made possible.

THE ENGINEERING PROFESSION UNITED TO SERVE AMERICA

CHAIRMAN.....J. PARKE CHANNING
1st VICE-CHAIRMAN.....D. S. JACOBUS
2d VICE-CHAIRMAN.....CHAS. S. CHURCHILL
SECRETARY.....ALFRED D. FLINN

41,000 Members

REPRESENTATIVES OF MEMBER SOCIETIES

American Society of Civil Engineers

Charles S. Churchill
Joseph R. Worcester

Arthur N. Talbot
Alex. C. Humphreys

Charles F. Loweth

American Institute of Mining and Metallurgical Engineers

Philip N. Moore
Sidney J. Jennings

George F. Kunz
J. Parke Channing

Edwin Ludlow

American Society of Mechanical Engineers

Ira N. Hollis
Charles Whiting Baker

George J. Foran
Mortimer E. Cooley

David S. Jacobus

American Institute of Electrical Engineers

Harold W. Buck
E. Wilbur Rice, Jr.

Nathaniel A. Carle
Comfort A. Adams

Charles E. Skinner

United Engineering Society

Clemens Herschel
Irving E. Moulthrop

Benjamin B. Thayer
Calvert Townley

American Society for Testing Materials

Albert Ladd Colby

WASHINGTON OFFICE, M. O. LEIGHTON in Charge,

McLachlen Building, 10th and G Streets

Telephone, Franklin 3416

ENGINEERING COUNCIL

ENGINEERING SOCIETIES BUILDING
29 WEST THIRTY-NINTH STREET
NEW YORK

Employed professional Engineers have found themselves unprepared to meet the changes in economic conditions which have occurred during the last few years. They are now endeavoring to bring about increases of compensation so as to sustain themselves according to previous standards of living and to adjust the hitherto inadequate salaries of positions to their responsibilities. They have been placed at a greater disadvantage than men following vocations having well established betterment organizations.

With the purpose of helping to correct these unfavorable conditions, Engineering Council organized, in April last, a Committee on Classification and Compensation of Engineers, having the following members:

Major Committee

- Arthur S. Tuttle, Deputy Chief Engineer, Board of Estimate, New York City, Chairman, and Chairman of State and Municipal Engineers Section.
Francis Lee Stuart, Consulting Engineer, New York City, Chairman Railroad Engineers Section.
John C. Hoyt, Hydraulic Engineer, U. S. Geological Survey, Washington, D. C., Chairman, Federal Government Engineers Section.
Charles Whiting Baker, Consulting Engineer, New York City. Chairman, Public Affairs Committee, Engineering Council.
M. O. Leighton, Consulting Engineer, Washington, D. C., Chairman, National Service Committee, Engineering Council.

State and Municipal Section

- Arthur S. Tuttle, Chairman.
M. M. O'Shaughnessy, City Engineer, San Francisco.
F. W. Cappelen, City Engineer, Minneapolis.

Railroad Section

- Francis Lee Stuart, Chairman.
Frank H. Clark, Consulting Engineer, New York City.
Bion J. Arnold, Consulting Engineer, Chicago.

Federal Government Section

- John C. Hoyt, Chairman.
John S. Conway, Deputy Commissioner of Lighthouses, Washington.
O. C. Merrill, Chief Engineer, Forest Service, Washington.

The Federal Section has submitted a preliminary report which is presented herewith to the engineering public for criticism and suggestions.

Careful consideration of all phases of the question from the standpoint of both employer and employee is invited to the end that the final report may serve as a basis for a rational system of classification and the establishment of proper employment policies, with adequate compensation, applying, so far as practicable, to all branches of the engineering profession and all lines of engineering work.

It is highly important that members of the Profession interest themselves actively in this subject, because the right solution of the problem is essential to the welfare of individual members of the Profession and necessary in keeping its standards on a high plane. Special comment on the tentative grades and salary schedules will be appreciated. Please use the inclosed blank, in order that suggestions may be made on a uniform basis, and send your comments before December 15.

November 11, 1919.

ALFRED D. FLINN,
Secretary.

On account of the particular interest in the subject of classification of salaries among scientific and technical men other than engineers, The Washington Academy of Sciences has undertaken to publish and distribute this Report to the members of the societies affiliated with the Academy. The Committee believes that the classification and salary schedule herewith presented may with slight modification be made applicable to all scientific and technical positions in the Government service.

PRELIMINARY REPORT
ENGINEERING COUNCIL, COMMITTEE
ON
CLASSIFICATION AND COMPENSATION OF ENGINEERS
IN THE SERVICE OF THE FEDERAL GOVERNMENT
NOVEMBER, 1919.

John C. Hoyt, Hydraulic Engineer, Geological Survey.
John S. Conway, Deputy Commissioner of Lighthouses.
O. C. Merrill, Chief Engineer, Forest Service.

INTRODUCTION

The executive branch of the Federal Government comprises over 50 independent establishments. These include, besides the ten departments, numerous commissions, boards and other organizations. For administrative purposes and for the accomplishment of specific work these establishments are divided into organization units. The work of the professional engineer enters in large measure either directly or indirectly into the activities of all these establishments.

In the gradual development of the executive branch of the Federal Government, which has extended over the entire period of the history of the country, units of organization have been created one by one to meet growing needs. To carry on the work of these new units and to provide for the growth of older ones a great expansion in personnel has been required. In this expansion too little consideration has been given to the special requirements of the several positions; to the relation of these positions to one another, either in the same or in different organization units; or to the relation between the units themselves. As a result there have grown up many inequalities and injustices which affect adversely both the employee and the organization. Although these inequalities and injustices exist in all lines of government work, they are especially noticeable in organization units which comprise engineering and other professional positions. It is to the end that these inequalities and injustices may be pointed out and that methods may be suggested for their correction that this report has been prepared.

COLLECTION OF DATA

The collection of data for a study of this kind may be made in the following ways:

1. By questionnaires for individuals.
2. By questionnaires for groups.
3. By study of existing reports.
4. By interviews.

Each of these methods was used except the individual questionnaire. The psychological effect of a questionnaire giving each employee an opportunity to state his personal views was fully recognized, but it was believed that such statements, involving a large amount of clerical work in tabulation and study, with every possibility of a lack of uniformity in preparation, would not yield concise and systematic information for the solution of the problem before this committee.

In making the study the group questionnaire of the form indicated in Table 1, page 9, was sent to the heads of the departments and other independent establishments with the request that one be filled out for each organization unit composed primarily of engineers. Favorable responses were received from all except the War Department, which stated that it would be impracticable to furnish the information desired.

As a result of the inquiry questionnaires were returned by twenty organization units, sixteen in civil establishments and four in the Navy Department, employing an aggregate of about 4,600 engineers. In the analysis of these questionnaires it was necessary to interview officials and to consult existing reports. The study was conducted along two lines, as follows:



1. A classification, which consists in naming, defining, and grouping the positions under a system of vocations and grades which will permit the making of adequate comparisons.

2. An outline of an employment policy and a recommendation of a salary scale which will provide equitable compensation for services rendered and will make it possible to secure and retain a competent personnel for the conduct of Government business.

The committee is continuing its study of the subject and will present a final report as soon as the analysis is completed.

PRELIMINARY STATEMENT OF FINDINGS AND CONCLUSIONS.

The preliminary analysis of the questionnaires has shown the lack of any adequate or consistent employment policy with respect to engineers and other technical employees in the Government service. This is shown by the following conditions, which are believed to be largely responsible for the unsatisfactory status of this class of Government employees:

1. Absence of any system of grading of positions.

2. Lack of uniformity in classes of positions and in their titles and duties.

3. Inequalities in compensation for positions of the same grade in different organization units.

4. Generally inadequate compensation for services rendered.

To the end that these conditions may be corrected and proper and equitable conditions of employment established for engineers, as well as for other Government employees, the following practices and principles are recommended:

1. Positions should be classified in accordance with the character of the duties to be performed and with the training and experience necessary for their performance, as indicated by a system of grading.

2. Within the salary limits fixed for each grade, there should be a system of advancement through the grade based upon experience gained in the position and upon proof of increase in the proficiency of the employee in performing the duties of the grade.

3. Promotions from grade to grade should depend upon the existence of a vacancy in the higher grade and proof that the employee is qualified to fill the vacancy.

4. The determination of adequate salary schedules should take into account and properly weigh the following considerations:

(a) The capital invested, both in money and in time, in obtaining the requisite fundamental training.

(b) The amount and character of experience and the degree of personal ability required.

(c) The relative value of the classes of work to be performed.

(d) The amount paid for similar work in private employment.

(e) The amount necessary to enable the employee to maintain a standard of living commensurate with the general standards of the community for positions of similar dignity and responsibility.

(f) The amount necessary to procure for and retain in the Government service a class of employees capable of conducting the business of the Government with an efficiency and a spirit of initiative equal to that of private business.

5. In the interest of an adequate social policy, no position likely to be occupied by individuals of an age to assume family responsibilities should fail to pay an amount sufficient to permit the maintenance of the average family in reasonable decency and comfort.

6. In the interest of the employees as a whole and of the proper conduct of the work of the Government, a system should be established by which employees who fail to maintain satisfactory standards of service should be removed, transferred, demoted, or retired as may be equitable in the circumstances.

CLASSIFICATION

The absence of any adequate system of classification in the Government service was brought out clearly by the investigation as evidenced by the numerous titles of positions submitted by the twenty reporting bureaus. Many of these were little more than payroll titles, were neither consistent nor uniform, and gave little indi-

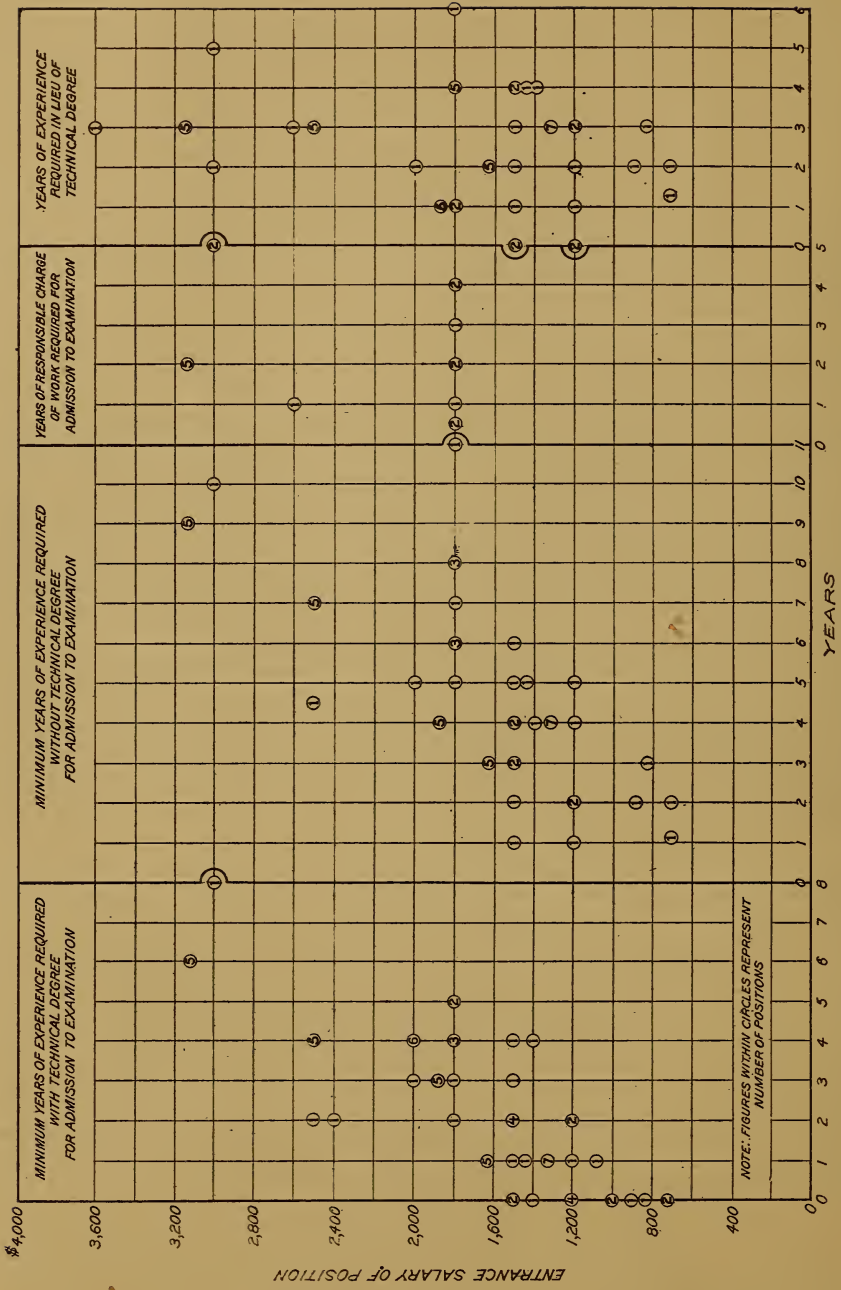


FIGURE 1.—Years of experience now required for admission to certain positions with and without technical degree.

cation of the character of the duties required by the positions. Furthermore, there is a surprising lack of uniformity in the entrance requirements for various positions, as illustrated by figure 1. This figure shows, for some 80 current civil service examinations for engineering positions in the Federal Government service, the years of preliminary experience, both with and without a technical degree, which are held as a prerequisite for admission to examination, the number of years in responsible charge of work which are required, and the credit in years of experience which are given for a technical degree.

The fundamental points to be considered in a classification of positions designed for the purpose of determining proper scales of compensation and other conditions pertaining to employment are:

1. The type of work, as indicated by the vocation in which the position falls.
2. The grade of work, as determined by the proficiency and responsibilities involved.

The type of work pertaining to a position, whether it represents a calling, a business, a trade, or other activities, including professional as well as mechanical operations, determines what is commonly termed the vocation or occupation of the individual holding the position. Vocations having similar characteristics may be grouped into services, such as engineering, scientific, clerical, artisan, etc.

In the professional engineering service, as the term is generally understood, the following vocations are found in the activities of the Federal Government:

Aeronautical Engineer
Architect
Chemical Engineer
Civil Engineer
Electrical Engineer
Forestry Engineer
Marine Engineer
Mechanical Engineer
Metallurgical Engineer
Mining Engineer
Naval Architect
Ordnance Engineer

Although positions in a vocation have similar characteristics in respect to the type of work, there are individual differences which depend on the responsibilities and proficiency involved. Such differences may be indicated by a system of grading that will be common to vocations in the same or similar services. In such a system of grading it is important to maintain the following principles:

1. That it shall provide a distinct means of comparing positions within the several vocations.
2. That it shall provide for comparison on an equitable basis of positions involving independent work with those involving administrative duties.
3. That it shall indicate a direct line of promotion from grade to grade and give an opportunity for regular advancement within a grade.

In the questionnaire used for collecting data for this report there were eight grades—four administrative and four nonadministrative. The data collected as summarized in Table 1, page 9 show that this system of grading was unsatisfactory in two respects:

1. It did not give a fair relative consideration of administrative and nonadministrative work.
2. It gave too wide a range of positions in Grade 8.

The study showed that the needs of the engineering services would be better served if the positions in the eighth grade were distributed among the first four and the definitions of the other grades extended to cover both administrative and nonadministrative positions. On this basis the following seven grades are proposed. This system of grading applies equally well to positions in any professional vocation.

PROPOSED GRADES FOR ENGINEERING VOCATIONS.

PROFESSIONAL.

1. CHIEF ENGINEER.

Duties: To act in chief administrative charge of a technical organization, or of a main division thereof; to determine the general policies of the organization under the limitations imposed by law, regulation, or other fixed requirement; to have final responsibility for the preparation of reports, cost estimates, designs, and specifications and for the construction, maintenance, or operation of engineering works or projects; to have full charge of the collection and presentation of data for and the conduct of valuation proceedings; to conduct or direct the most comprehensive lines of engineering research; or to act as a consulting specialist on important engineering works, projects, policies, or valuations.

Qualifications: Training and experience of a character to give substantial evidence of engineering knowledge and ability or of executive capacities of highest order along lines of work similar to those involved in the position to be occupied and of at least twelve years' duration, of which at least four years shall have been in duties of Engineer, or their equivalent, and at least five years in responsible charge of important work or projects. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

2. ENGINEER.

Duties: Under general administrative direction and within the limits of the general policies of the organization, to have responsible charge of and to initiate and determine policies for a major subdivision of an organization; to prepare for final executive action reports, cost estimates, designs, specifications, and valuation studies and data; to have immediate charge of the construction, maintenance, or operation of engineering works or projects of major importance; to conduct or direct major lines of engineering research; or to furnish for executive action expert or critical advice on engineering works, projects or policies.

Qualifications: Active professional practice or executive charge of work for at least eight years, of a character to demonstrate a high degree of initiative and of ability in the administration, design, or construction of engineering work or projects of major importance, of which at least three years shall have been spent in duties of Senior Assistant Engineer, or their equivalent, and at least three years in responsible charge of work. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

3. SENIOR ASSISTANT ENGINEER

Duties: Under general administrative and technical direction, to be in responsible charge of an intermediate division of an organization; to exercise independent engineering judgment and assume responsibility in studies and computations necessary for the preparation of reports, cost estimates, designs, or valuations; to have immediate charge of the construction, maintenance, or operation of important engineering works or projects; or to conduct or direct important lines of engineering research.

Qualifications: Active professional practice or executive charge of work for at least five years, of which at least three years shall have been spent in duties of Assistant Engineer, or their equivalent, with at least one year in responsible charge of work. Fundamental training equivalent to that represented by professional de-

gree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

4. ASSISTANT ENGINEER

Duties: Under specific administrative and technical direction, to be responsible for the conduct of the work of a minor subdivision of an organization; to collect and compile data for specific items of engineering studies; to take immediate charge of field survey projects and of the design and construction of minor engineering work; to lay out and develop work from specifications and to supervise the work of a drafting or computing force; or to conduct specific tests or investigations of apparatus, material, or processes.

Qualifications: Experience for at least two years in duties of Junior Assistant Engineer or their equivalent. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

5. JUNIOR ASSISTANT ENGINEER

Duties: Under immediate supervision, to perform work involving the use of surveying, measuring, and drafting instruments; to take charge of parties on survey or construction work; to design details from sketches or specifications; to compute and compile data for reports or records; to inspect or investigate minor details of engineering work; or to perform routine tests of apparatus, material, or processes.

Qualifications: No experience required other than that involved in securing a professional degree upon the completion of a standard course of engineering instruction in an educational institution of recognized standing; but in absence of such degree, a high school education or its equivalent is required and at least four years' experience in the use of surveying, measuring or drafting instruments or the computation and compilation of engineering data, together with evidence of a knowledge of the fundamentals of engineering science sufficient, with further experience to qualify for the higher professional grades. The completion of each full year of such standard course of engineering instruction shall be considered as the equivalent of one year of experience.

SUB-PROFESSIONAL.

6. AID.

Duties: To operate, adjust, and care for surveying instruments and take charge of small parties on survey or construction work; to compute or supervise the computation of surveys, estimates, and data for reports or records; to plot or supervise the plotting of notes and maps and direct the work of a drafting squad; to design details; or to prepare general working drawings where design is furnished; or to inspect or investigate minor details of engineering work.

Qualifications: Experience for two years in the use and care of surveying and drafting instruments; or as rodman, chainman, or levelman; or in tracing, lettering, and drafting; or as recorder or computer. Graduation from or attendance at an engineering school not required, but candidate must have had a high-school education, or its equivalent, and be familiar with the construction, operation, and care of surveying instruments and with the use of the slide rule and logarithmic and other simple computation tables.

7. JUNIOR AID

Duties: To perform miscellaneous subordinate duties in the office or field; to act as rodman, chainman, tapeman, levelman, or recorder; to trace or letter maps and drawings; to alter tracings to agree with work or sketches of work; to make simple drawings or details from sketches or data; or to perform minor computations.

Qualifications: Education equivalent to graduation from high school.

Under the plan outlined above, the classification of positions consists in:

1. Determining the vocation, using the list on page 5 as a guide.
2. Determining the grade in accordance with the seven grades proposed. This is the most difficult and important part of the classification.
3. Naming and defining the class.

In the classification special case should be taken to insure that the class names are distinctive and that they indicate as nearly as possible the character of work performed by the occupant of the position. The number of classes should be kept at a minimum, and new classes should not be established unless they are required by a difference in duties sufficiently distinctive to make necessary separate civil service examination. Only one class is suggested for the junior assistant and assistant grades, as these grades are largely of a general preparatory nature from which a man may advance to any one of the specific classes in the higher grades.

Below is a list of typical classes of positions in the civil engineering vocation in the Government service. Similar typical classes may be formed for other engineering vocations.

TYPICAL CLASSES OF POSITIONS IN VARIOUS GRADES IN THE CIVIL ENGINEERING VOCATION

PROFESSIONAL GRADES

1. *Chief Engineer*

Director
Superintendent
Chief Engineer
Consulting Engineer
Commissioner
Etc.

2. *Engineer*

Bridge Engineer
Civil Engineer
Drainage Engineer
Geodetic Engineer
Highway Engineer
Hydraulic Engineer
Irrigation Engineer
Municipal Engineer
Railroad Engineer
Reclamation Engineer
Sanitary Engineer
Structural Engineer
Etc.

3. *Senior Assistant Engineer*

Senior Assistant Bridge Engineer
Senior Assistant Hydraulic Engineer
Senior Assistant Sanitary Engineer
Senior Assistant Structural Engineer
Etc.

4. *Assistant Engineer*

Assistant Engineer
Etc.

5. *Junior Assistant Engineer*

Junior Assistant Engineer
Etc.

SUB-PROFESSIONAL GRADES

6. *Aid*

Draftsman
Instrumentman
Computer
Etc.

7. *Junior Aid*

Tracer
Rodman
Chainman
Etc.

INEQUALITIES OF COMPENSATION IN DIFFERENT ORGANIZATION UNITS

The inequality in compensation for positions of the same grade in different organization units is strikingly shown by the questionnaires. These differences are indicated in Tables 1 and 2 and in figure 2.

TABLE 1.—*Summary of present salaries by grades.*

Grade.	General description of duties.	16 Engineering Bureaus in Civil Establishments.				4 Engineering Bureaus in Navy Department.					
		No. of persons.	Average.	Maximum.	Minimum.	Per cent increase of the average since July 1, 1915.	No. of persons.	Average.	Maximum.	Minimum.	Per cent increase of the average since July 1, 1915.
1	Chief administrative officer having full charge of organization including de-termination of policy.	16	\$5,867	\$10,000	\$4,500	3.0	2	\$9,450	\$9,900*	\$9,000*	0.0
2	Chief of major subdivision in responsible charge of large unit.	83	3,801	7,500	1,800	5.0	4	6,381	9,000*	5,200	0.0
3	Chief of intermediate subdivision in re-sponsible charge.	209	3,104	5,000	1,800	9.9	22	4,312	5,634	2,304	57.6
4	Chief of minor subdivision.	846	2,222	4,500	1,020	9.0	54	3,600	4,883	2,304	58.2
5	On general duty under direction but re-quiring special education and training and the use of initiative and originality.	1,353	1,719	3,000	1,000	13.3	192	2,818	3,756	1,878	52.2
6	On subordinate duty requiring special education or training but not requiring special originality.	1,092	1,293	2,817	600	12.0	218	1,954	4,257	1,500	38.4
7	On subordinate duty not requiring special education, training, or originality.	169	975	1,340	480	19.3	81	1,379	2,254	1,002	37.2
8	On special duty of responsible character requiring special qualifications and initiative.	189	1,812	7,500	1,200	3.9	21	2,717	4,382	1,628	1.3
	Totals.....	3,957					594				

*Naval Officers, all others are civilian.

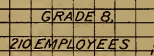
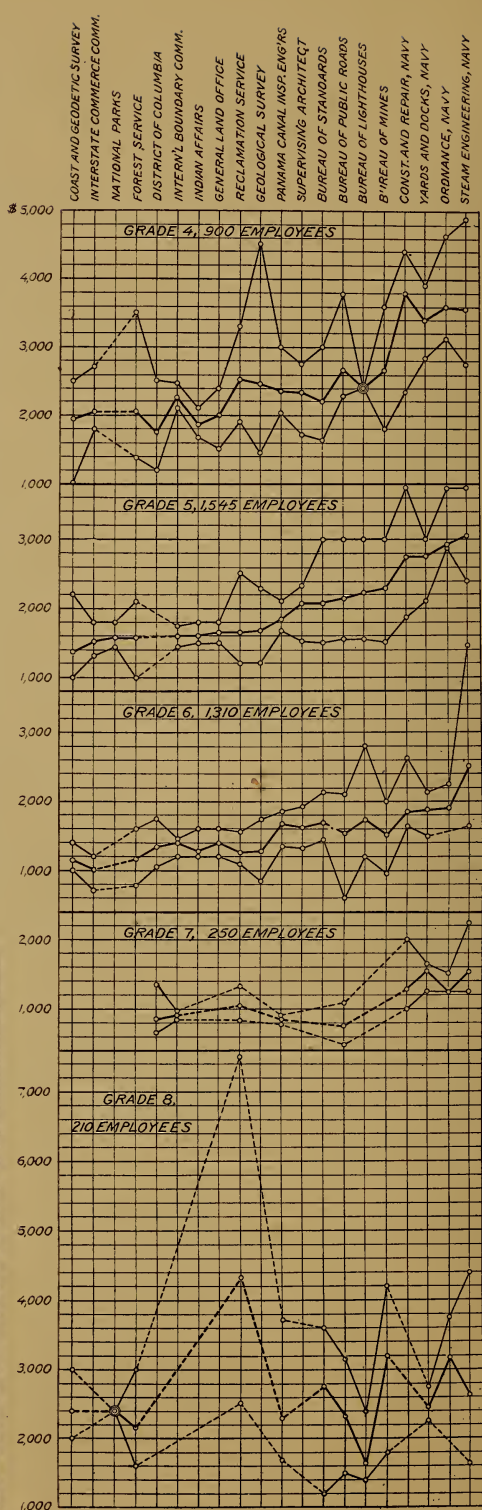
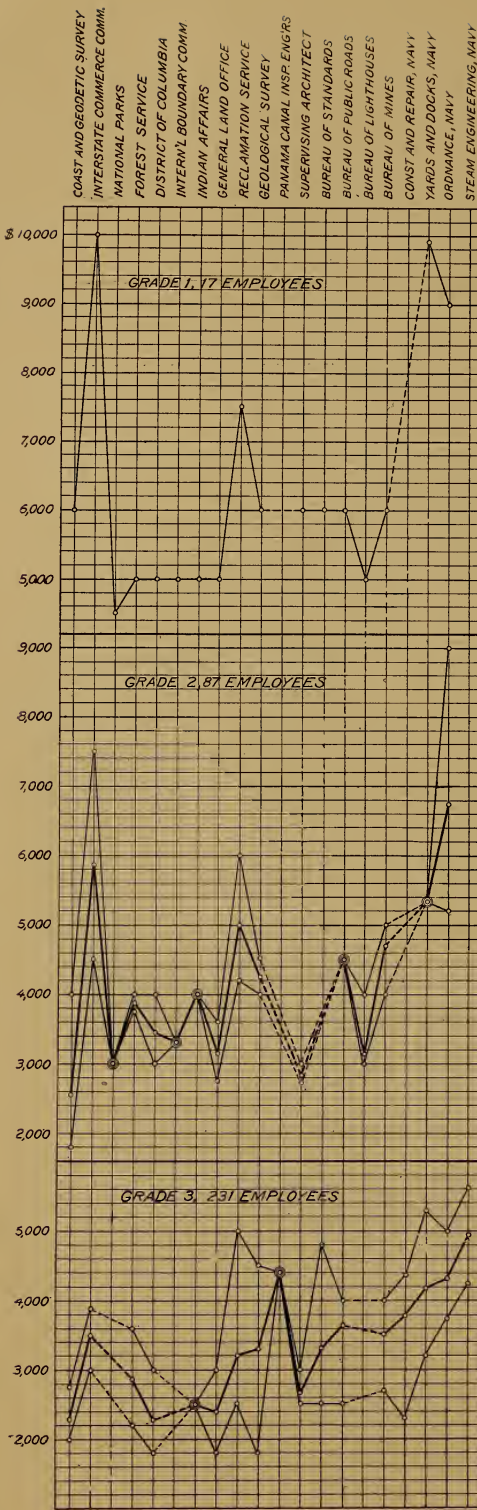


FIGURE 2.—Comparison of present average maximum and minimum salaries.

The two principal reasons for these inequalities in compensation are as follows:

1. The absence of any system of graded classification in the Government service.
2. The different methods used by Congress in making appropriations for salaries, one of which is known as the "lump sum" and the other as the "statutory."

The extreme discrepancies shown in Table 1 and on figure 2 would not be possible if there existed even an approximately adequate system of grading of positions.

A considerable number of engineering positions, particularly in the lower grades, are on the "statutory roll"—that is, the salaries for the positions are fixed annually by Congress in the bill which carries the appropriation for the department. With few and unimportant exceptions, these statutory salaries have not been changed since the date they were first fixed by Act of Congress, ten, twenty, or forty years ago. Hundreds of statutory positions are now vacant, and the money appropriated for them is turned back into the Treasury because it is impossible to fill them at the rates which Congress has fixed. The salaries of the greater part of the technical positions, however, are paid from "lump-sum" appropriations and are fixed by the head of the Department, although Congress ordinarily limits the amount which may be paid as salary under a lump sum appropriation—for example, the \$4,500 maximum limit in the Department of Agriculture. Notwithstanding these limitations, the general scale of salaries on the "lump sum" roll is less inadequate than that on the "statutory" roll. This explains in part the variation in salaries paid for similar positions in different bureaus. For example, the salaries for engineering positions in the General Land Office and in the Coast and Geodetic Survey, where there are many statutory positions, are less than those in the Bureau of Standards and in the Geological Survey. Furthermore, compensation in the younger bureaus, such as the Bureau of Mines and the Interstate Commerce Commission, is generally higher than in the older bureaus.

The most striking inequality disclosed by the questionnaires is that between the several civilian bureaus and the four bureaus of the Navy Department. With the exception of Grades 1 and 2, the positions reported for the Navy Department are filled by civilian employees. In 1915 the average salaries in the Navy bureaus in Grades 3 to 7, inclusive, exceeded the average in the civilian bureaus by 2 to 20 per cent. The excess in 1919 is from 40 to 64 per cent. The highest average increase in any grade for the civilian bureaus for the four-year period 1915-1919 is \$265 in Grade 3, or \$66 a year. The highest average increase in the Navy bureaus is in the same grade and amounts to \$1,576, or \$394 a year. This inequality is due to the fact that the salary schedules fixed by the Labor Adjustment Board in its decision of October 24, 1918, were made applicable to the Navy Department, but to none of the other bureaus covered by this report.

Inequalities of this character can be eliminated only by the establishment of a properly graded classification with definite salary limits and having clear definitions of the duties and responsibilities involved and of the amount and character of training and experience required for the several grades.

INADEQUATE COMPENSATION FOR SERVICES.

One of the principal objects of the work of the committee has been to determine an adequate compensation scale for engineering positions in the Government service. In the determination of such a scale, two principles are controlling:

1. No position should pay less than a reasonable living wage.
2. Every position should pay the amount necessary to secure for and retain in the Government service employees capable of conducting the business of the Government with an efficiency and a spirit of initiative equal to that required in private business.

By a "living wage" is meant the amount which will maintain in decency and comfort both the incumbent of the position and his dependents. There are certain positions which are ordinarily occupied by young men and women who are starting on their life work and who have not yet assumed family responsibilities. In so far as the incumbents of these positions fill them temporarily as a means of advancement to positions of greater compensation—are in effect serving as apprentices—the living wage need not be based on a "family" standard. When, however, any position is likely to be occupied more than temporarily by individuals of an age at which they should naturally assume family responsibilities, the minimum

TABLE No. 2.—Present Minimum, Maximum, and Average Salaries by Grades, and Average Increase in 4-year Period, 1915-1919, for Sixteen Engineering Bureaus in Civil Establishments and for Four Engineering Bureaus in the Navy Department.

Department and Bureau.	GRADE 1.					GRADE 2.					GRADE 3.					GRADE 4.								
	No. of persons.	Maximum.	Minimum.	Average 1919.	Average 1915.	Average increase.	No. of persons.	Maximum.	Minimum.	Average 1919.	Average 1915.	Average increase.	No. of persons.	Maximum.	Minimum.	Average 1919.	Average 1915.	Average increase.	No. of persons.	Maximum.	Minimum.	Average 1919.	Average 1915.	Average increase.
Agriculture:																								
Bureau of Public Roads.....	1	\$6,000	\$6,000	\$6,000	\$4,500	\$1,500	1	\$4,500	\$4,500	\$4,500	\$4,000	\$500	18	\$4,000	\$2,500	\$3,641	\$3,250	\$391	59	\$3,780	\$2,280	\$2,656	\$2,379	\$277
Forest Service.....	1	5,000	5,000	5,000	5,000	0	2	4,000	3,750	3,875	3,375	500	10	3,600	2,200	2,850	2,250	600	45	3,500	1,380	2,055	1,820	235
Commerce:																								
Coast and Geodetic Survey.....	1	6,000	6,000	6,000	6,000	0	12	4,000	1,800	2,542	2,791	-249	15	2,750	2,000	2,290	2,240	50	41	2,500	1,020	1,957	1,957	0
Bureau of Lighthouses.....	1	5,000	5,000	5,000	5,000	0	20	4,000	3,000	3,130	2,650	480	8	4,800	2,520	3,305	.....	.....	14	3,000	1,620	2,182	.....	0
Bureau of Standards.....	1	6,000	6,000	6,000	6,000	0	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0
Interior:																								
Bureau of Mines.....	1	6,000	6,000	6,000	6,000	0	8	5,000	4,000	4,685	.....	.....	20	4,000	2,700	3,510	.....	.....	13	3,600	1,800	2,662	.....	182
General Land Office.....	1	5,000	5,000	5,000	5,000	0	3	3,600	2,750	3,150	.....	.....	28	3,000	1,800	2,404	2,404	0	84	2,400	1,500	2,000	.....	182
Geological Survey.....	1	6,000	6,000	6,000	6,000	0	5	4,500	4,000	4,244	4,125	119	16	4,500	1,800	3,294	3,246	48	171	4,500	1,440	2,449	.....	206
National Park Service.....	1	4,500	4,500	4,500	4,500	0	2	3,000	3,000	3,000	3,000	0	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Office of Indian Affairs.....	1	5,000	5,000	5,000	5,000	0	1	4,000	4,000	4,000	4,000	0	6	2,500	2,500	2,500	2,291	209	15	2,100	1,680	1,860	.....	107
Reclamation Service.....	1	7,500	7,500	7,500	6,500	1,000	3	6,000	4,200	5,000	5,500	-500	33	5,000	2,620	3,220	3,040	180	30	3,300	1,920	2,520	2,420	100
Treasury:																								
Supervising Architect.....	1	6,000	6,000	6,000	6,000	0	7	3,000	2,620	2,845	2,830	15	9	3,000	2,520	2,675	2,622	53	112	2,750	1,720	2,334	2,181	153
Independent Establishments:																								
Internat'l Boundary Comm.....	1	5,000	5,000	5,000	5,000	0	1	3,300	3,300	3,300	2,500	800	9	3,900	3,000	3,500	.....	.....	222	2,700	2,100	2,246	1,818	428
Interstate Commerce Comm.....	1	10,000	10,000	10,000	10,000	0	13	7,500	4,500	5,860	.....	.....	33	3,900	3,000	3,500	.....	.....	.....	.....	.....	.....	.....	.....
Panama Canal—Insp. Engr.....	0	.....	.....	.....	.....	.....	0	.....	.....	.....	.....	.....	1	4,400	4,400	4,400	4,000	400	4	3,000	2,040	2,559	.....	.....
District of Columbia.....	1	5,000	5,000	5,000	5,000	0	5	4,000	3,000	3,440	3,300	140	12	3,400	1,800	2,283	1,996	287	26	2,500	1,200	1,753	1,614	141
Maxima and minima.....	15	10,000	4,500	5,867	5,786	178	83	7,500	1,800	3,801	3,110	154	209	5,000	1,800	3,104	2,685	265	846	4,500	1,020	2,222	2,087	188
Averages.....		5,867	5,867	5,867	5,867	.....	.....	4,314	3,459	3,264	.....	.....	.....	5,726	2,481	.....	2,950	.....	.....	2,966	1,721	2,222	2,087	.....
Navy Department:																								
Bureau of Construction and Repair.....	1	9,000	9,000	9,000	9,000	0	3	9,000	5,200	6,733	.....	.....	8	4,382	2,304	3,774	3,180	594	17	4,382	2,304	3,774	3,774	1,590
Bureau of Ordnance.....	1	9,000	9,000	9,000	9,000	0	3	9,000	5,200	6,733	.....	.....	5	9,008	3,736	4,317	2,642	1,675	15	4,625	2,800	3,606	2,911	1,395
Bureau of Steam Engineering.....	1	9,900	9,900	9,900	9,900	0	1	5,325	5,325	5,325	5,325	0	2	5,634	4,257	4,946	2,504	2,482	10	3,863	2,754	3,568	2,611	657
Bureau of Yards and Docks.....	1	9,900	9,900	9,900	9,900	0	1	5,325	5,325	5,325	5,325	0	8	5,300	3,200	4,185	2,334	1,831	12	3,900	2,829	3,375	2,204	1,171
Maxima and minima.....	2	9,900	9,000	9,450	9,450	0	4	9,000	5,200	6,381	.....	.....	22	5,634	3,204	4,312	2,736	1,576	54	4,833	2,304	3,600	2,275	1,325
Averages.....		9,450	9,450	9,450	9,450	.....	.....	7,162	5,262	6,381	.....	.....	.....	5,081	3,379	.....	4,312	.....	.....	4,449	2,754	3,600	3,600	.....
All Bureaus:																								
Maxima and minima.....	17	10,000	4,500	6,288	6,288	156	87	9,000	1,800	3,020	3,147	151	231	5,634	1,800	3,210	2,690	436	900	4,833	1,020	2,305	2,103	282
Averages.....		6,288	6,288	6,288	6,288	.....	.....	4,670	3,684	3,298	.....	.....	.....	4,045	2,698	.....	3,126	.....	.....	3,278	1,943	2,305	2,103	.....

	GRADE 5.				GRADE 6.				GRADE 7.				GRADE 8.										
Agriculture:	168	\$3,000	\$1,560	\$2,141	\$1,869	\$272	138	\$2,100	\$600	\$1,537	\$1,235	\$302	9	1,080	480	767	7	3,150	1,500	2,341	1,600	741	
Bureau of Public Roads.....	54	2,100	1,000	1,580	1,230	350	117	1,600	780	1,150	872	278	0	0	0	0	42	3,000	1,600	2,104	2,108	56	
Commerce:	87	2,000	1,000	1,385	1,116	269	48	1,400	1,000	1,138	1,249	-111	0	0	0	0	11	3,000	2,000	2,400	2,400	0	
Bureau of Geodetic Survey.....	22	1,000	1,560	2,227	2,200	27	57	2,817	1,200	1,737	1,636	101	0	0	0	0	14	2,400	1,380	1,637	1,481	156	
Bureau of Lighthouses.....	18	3,000	1,500	2,085	.....	.....	9	2,120	1,440	1,696	.....	.....	0	0	0	0	14	3,600	1,200	2,798	.....	.....
Bureau of Standards.....	38	3,000	1,500	2,293	.....	.....	107	2,000	960	1,506	.....	.....	0	0	0	0	33	4,200	1,800	3,188	.....	.....
Bureau of Mines.....	106	1,800	1,500	1,650	1,650	0	102	1,600	1,200	1,400	1,400	0	0	0	0	0	55	6,260	1,565	.....	.....	.....
General Land Office.....	119	2,280	1,200	1,675	1,344	332	73	1,740	840	1,285	1,180	105	0	0	0	0	1	2,400	2,400	2,400	.....	.....
Geological Survey.....	3	1,800	1,440	1,580	.....	.....	0	.....	.....	.....	.....	.....	0	0	0	0	0	.....	.....	.....	.....	.....
National Park Service.....	3	1,800	1,500	1,600	1,600	150	5	1,600	1,200	1,280	1,200	80	0	0	0	0	6	7,500	2,520	4,320	4,800	-480	
Office of Indian Affairs.....	373	2,520	1,200	1,650	1,500	150	71	1,560	1,080	1,265	1,200	65	110	1,320	840	1,040	900	0
Reclamation Service.....	65	2,320	1,520	2,074	1,740	334	12	1,920	1,320	1,612	1,530	82	0	0	0	0	0	.....	.....	.....	.....	.....
Supervising Architect.....	2	1,740	1,440	1,590	1,400	190	12	1,440	1,200	1,400	1,020	380	30	960	840	900	600	0
Independent Establishments:	293	1,800	1,320	1,517	285	1,200	720	1,006	0	0	0	0	0	0
Internal Boundary Comm.....	9	2,100	1,680	1,840	.....	.....	13	1,860	1,350	1,687	.....	.....	3	900	780	860	6	3,720	1,680	2,280	.....	.....
Interstate Commerce Comm.....	0	43	1,740	1,050	1,336	1,200	136	17	1,340	650	838	78	0
Panama Canal—Insp. Engrs.....	1,353	3,000	1,000	1,719	1,544	206	1,092	2,817	1,063	1,293	1,221	146	169	1,340	480	975	189	7,500	1,200	1,812	2,196	86	
District of Columbia.....	2,297	1,395	1,750	.....	.....	.....	.....	.....	.....	*1,367	.....	.....	.....	1,120	718	*988	0	3,923	1,764	2,282	.....	.....
Maxima and minima.....
Averages.....
Navy Department:	64	3,756	1,878	2,754	1,810	944	42	2,629	1,628	1,869	1,480	389	13	2,003	1,002	1,287	0	3,756	.....	3,150	3,005	175
Bureau of Construction and	46	3,756	2,880	2,937	1,662	1,275	83	2,254	.....	1,897	1,327	570	33	1,502	.....	1,250	5	3,756	.....	2,629	2,629	.....
Repair.....	12	3,756	2,379	3,057	2,195	862	24	4,267	2,520	2,709	1,709	811	16	2,254	1,252	1,518	10	3,322	1,628	2,629	.....	.....
Bureau of Ordnance.....	70	3,000	2,100	2,757	1,809	948	69	2,128	1,500	1,878	1,280	588	19	1,627	1,250	1,548	0	2,794	2,253	2,468	2,504	-36	
Bureau of Steam Engineering
Bureau of Yards and Docks.....	192	3,756	1,878	2,818	1,851	967	218	4,257	1,500	1,954	1,412	542	81	2,254	1,002	1,379	21	4,382	1,628	2,717	2,753	-36	
Maxima and minima.....	3,567	2,309	2,818	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,846	1,108	*1,379	.....	3,631	1,940	*2,717	.....	.....
Averages.....	*1,954
All Bureaus:	1,545	3,756	1,000	1,856	1,585	337	1,310	4,257	600	1,403	1,262	248	250	2,254	480	1,106	210	7,500	1,200	1,902	2,269	103	
Maxima and minima.....	.....	2,656	1,587	1,856	.....	.....	.....	1,998	1,150	1,403	1,262	248	.....	1,443	887	*1,122	.....	3,856	1,794	1,902	2,269	.....
Averages.....	.....	.....	.....	*1,922	.....	.....	.....	.....	.....	*1,510	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,372	.....	.....

*For position for which data available in both 1915 and 1919.

salary for the position should not be less than that necessary to maintain an average family in respectability. It is a serious social condition when a man with wife and children is paid so low a salary that he is unable to maintain himself and family in conditions of reasonable decency and comfort. It is equally serious if young people are prevented from establishing homes of their own because their salaries do not permit it.

The following extract from the Monthly Labor Review (January, 1919, page 9), gives data concerning the cost of living in the City of Washington:

"In 1916 the typical white family, consisting of father, mother, and three children below the age of 15, was not able to make both ends meet with an income of less than \$1,150 per annum. This would indicate that a minimum-of-comfort budget, according to the practices and standards of domestic economy prevailing in Washington in 1916, must be about \$1,200. Since 1916 the cost of the necessities of decent living, weighed according to importance in the family budget, has advanced approximately 50 per cent. This indicates that an identical standard of decency can not be purchased for less than \$1,800 today."

Recent studies of the Bureau of Labor Statistics show that the above amount should be increased to somewhat over \$2,200. An examination of Table 1 shows that the average compensation paid in Grade 4 of the questionnaire, comprising 20 per cent of the positions reported, is practically identical with the amount now found by the Bureau of Labor Statistics as the minimum family budget; while for Grades 5, 6 and 7, comprising 65 per cent of the positions reported, the average compensation is far below that amount. The proportion of salaries that are less than a living wage would doubtless be found much greater in non-technical positions than in technical. While the Government is thus paying thousands of its highly trained clerical and technical force less than a living wage and, except for the temporary bonus of \$240 a year for positions paying salaries of \$2,500 or less, has ignored the constantly diminishing purchasing power of the salaries paid to this class of employees; it has, on the contrary, given full recognition to increased living costs in fixing wages in positions involving the organized labor crafts. A "shipfitter" in the Navy Yard, for example, receives \$1,750 a year, more than the average of Grade 5 in the questionnaire, while he is learning how to do his work. After three months of apprenticeship, he gets \$2,000. If he is made a "straw boss" in charge of 12 or more men, he gets \$2,450, and if a "sub-foreman" in charge of 30 or more men, he gets \$2,900, nearly as much as the average of Grade 3. A blacksmith (heavy fire) gets \$2,400. A "hammer and machine forger" (heavy) gets \$3,700, only \$100 less than the average of Grade 2 of the questionnaire.

In general, wages in industry have more than kept step with increases in the cost of living. The National Industrial Conference Board in its report on "War-time Changes in Industry" found that in eight leading industries during the period from September, 1914, to March, 1919, weekly earnings had increased from 62 per cent to 110 per cent, while average hourly earnings had increased from 74 per cent to 112 per cent. During approximately the same period the salaries of engineering positions in the 16 engineering bureaus in civil establishments increased on the average from 3 per cent to 19 per cent. Moreover, the fact should not be overlooked that not only was the percentage increase in industrial employment many times greater than in Federal service, but also that in many instances the amount paid for skilled labor is greater than the amount paid to the trained Government engineer. Over 40 of the labor crafts were awarded a rate of wage of \$2,000 and more by the Labor Adjustment Board. This amount is greater than the average paid for Grades 5, 6 and 7 in the questionnaire, comprising 65 per cent of the positions reported, as shown in Table 1. The skilled laborer is not required to know how to read or write, and he may receive full pay after an experience varying from two weeks to six months; the Government engineering employee, on the other hand, to get an equivalent amount, must have had from two to eight years' experience if he is not a technical graduate, and in many instances will not be admitted at all without a technical degree and then only with from two to four years' practical experience. (Fig. 1, page 4.)

That the salaries now paid are entirely inadequate for the purpose of recruiting for, and retaining in, the Government service the class of employees necessary to maintain the service on an efficient basis is evidenced by the rapidly increasing rate of turnover in the last few years. This is found no less in the higher paid

than in the lower paid positions. Unless this movement is checked in the only way in which it can be checked, namely, by recognizing that the Government service needs as high a quality of talent and experience as private business, and that it can secure this only by paying approximately the market price for such talent and experience, unless, in fact, the Government takes the same attitude towards its clerical and particularly toward technical personnel that it has taken toward skilled and unskilled labor, there will be in the future in still greater degree than in the past a progressive deterioration in personnel, and the Government service will be reduced to a training school for private business.

The committee expects to have for its final report definite data concerning the amount of turnover in technical positions and the variation in salaries paid within and without the Government service, a variation which is the primary cause of the turnover.

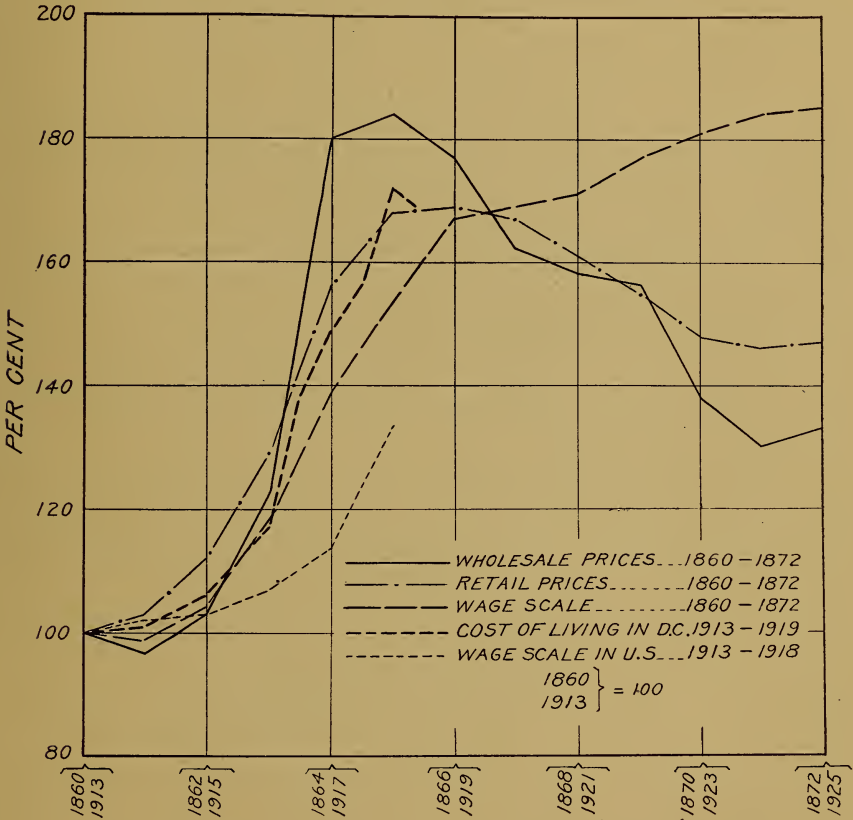


FIGURE 3.—Comparison of prices on wages 1861-1872 and 1913-1919.

A study of the change in prices and wages during and after the Civil War is of interest in connection with changes that have taken place from 1913 to 1919. The curves on figure 3, based on reports of the War Industries Board and Department of Labor, show these changes. During the Civil War retail prices rose to 164½ per cent of the prices in 1860 and wholesale prices to 182 per cent. From 1865 to 1872 all prices showed a gradual downward trend, and in 1872 the retail prices had fallen to 143 per cent and the wholesale to 126 per cent. From 1913 to 1919 the cost of living followed closely the trend of wholesale and retail prices from 1860

to 1865. If history repeats itself we can not expect a large reduction in prices during the next 8 or 10 years. It is interesting to note that the rise in wages during the Civil War was almost simultaneous with the rise in the prices of commodities. During the World War the rise in wages has lagged about a year behind the rise in prices. Furthermore, in the period immediately following the Civil War wages continued to rise after prices started to fall. The present price level is not considered merely temporary by such of our Government agencies as the Department of Labor and the Federal Reserve Board or by such economists as Irving Fisher^a and J. S. Holden^b. Substantial relief from the high cost of living therefore can not reasonably be expected through a decrease in prices; it must be met by increases in salaries.

PROPOSED SALARY SCALE FOR ENGINEERS.

No adequate salary scale, at the present time, can ignore the increase in the cost of commodities during the last few years or afford to assume that this increase is merely temporary.

The only serious attempt made by the Government to adjust salaries in engineering positions to existing conditions, so far as this committee has been able to learn, is its action through the Labor Adjustment Board in fixing wage scales for the Navy Department and the Emergency Fleet Corporation. This schedule, known as the "Macy scale," applies not only to skilled and unskilled labor but to the drafting and designing force in the ship and navy yards. This scale as applicable to engineering positions is shown graphically in figure 4.

The term "draftsman" as used in the Navy Department and in the award of the Labor Adjustment Board has a broader significance than is usually attached to the term. In the upper grades it involves a character of work and requires a degree of experience represented in ordinary practice by the terms "junior assistant engineer" and "assistant engineer." The duties of "chargeman," for example, involve the assumption of a considerable degree of responsibility over other men and direction of their work. A graduate of a technical school must have had at least two years' experience in a shipyard in order to qualify as "chargeman," and one who has not had technical training must have had at least five years of such experience. These are the qualifications proposed in the committee's definition of grades for "assistant engineer."

On figure 4 the wage scale has been plotted with ordinates representing dollars and abscissae representing the minimum years of experience prescribed in the award as a prerequisite for entrance into the several grades. The diagram has been plotted in two parts. The lower righthand corner shows the scale as applied to those who have had no technical school training. The lower part of this scale corresponds to the "sub-professional" grades as proposed by the committee. The last six years of this scale duplicate in salary range, but not in the experience requirements, the scale in the lefthand corner of the diagram. Both scales show maximum salary rates and minimum experience requirements. In both scales the rate of salary increase within any grade of positions (except draftsman, Grade C) is \$250 a year. On the "sub-professional" scale the general rate of increase, including both increases within the grade and promotions to a higher grade, is \$300. This may reach an average of \$425 a year for one who has entered as "second-class copyist" and is promoted to "chargeman" within the minimum allowable time.

In the "professional" scale the maximum rate of increase for one who enters as "draftsman, Grade C," and advances to "chargeman" in the minimum allowable time is \$750 a year, as compared with a maximum of \$425 for the sub-professional scale. If the arc of a circle is drawn through the points representing the entrance salaries for "draftsman, Grade C," "draftsman, Grade A," and "chargeman," the tangent to this curve will represent a maximum rate of increase of \$545 a year. A salary scale based on this line as a maximum would give amounts in the higher grades somewhat less than those now being paid in such grades in the Navy Department. The chief difference between the "sub-professional" and the "professional" scale is that in the latter the salary lines of the several grades overlap—

^a Fisher, Irving. The new price revolution, U. S. Dept. Labor, 1919.

^b Holden, J. S. Prices during the war and readjustment period, U. S. Dept. Labor, April, 1919.

ENGINEERING COUNCIL

COMMITTEE ON CLASSIFICATION AND COMPENSATION OF ENGINEERS

Suggestions and criticisms on abstract of Preliminary Report of Federal Engineers Section, proposed by

(Business address) -----

(Dated) -----

*(Please use continuation sheets if necessary, and mail to John C. Hoyt,
U. S. Geological Survey, Washington, D. C.)*

Definitions and titles of grades: (a) Suitable? -----
(b) Changes proposed: -----

Schedule of salaries: (a) Satisfactory? -----
(b) Changes proposed: -----

Application to your local conditions: (a) Favorable? -----
(b) Changes proposed: -----

Adoption for general use: (a) Desirable? -----
(b) Changes proposed: -----

Give general comment stating whether the above statements are those of an individual or of an organization.

that is, an individual may pass from grade to grade without having passed through all the salary ranges of each grade.

The several grades proposed by the committee are shown projected on this diagram on the basis of the minimum years of experience as proposed in the definitions adopted by the committee. For the two sub-professional grades of "junior aid" and "aid," and the lowest two professional grades of "junior assistant engineer" and "assistant engineer," the specifications of the committee are identical with those prescribed in the award of the Labor Adjustment Board. It is fair to assume that if the Macy scale had been extended to cover higher grade positions, it

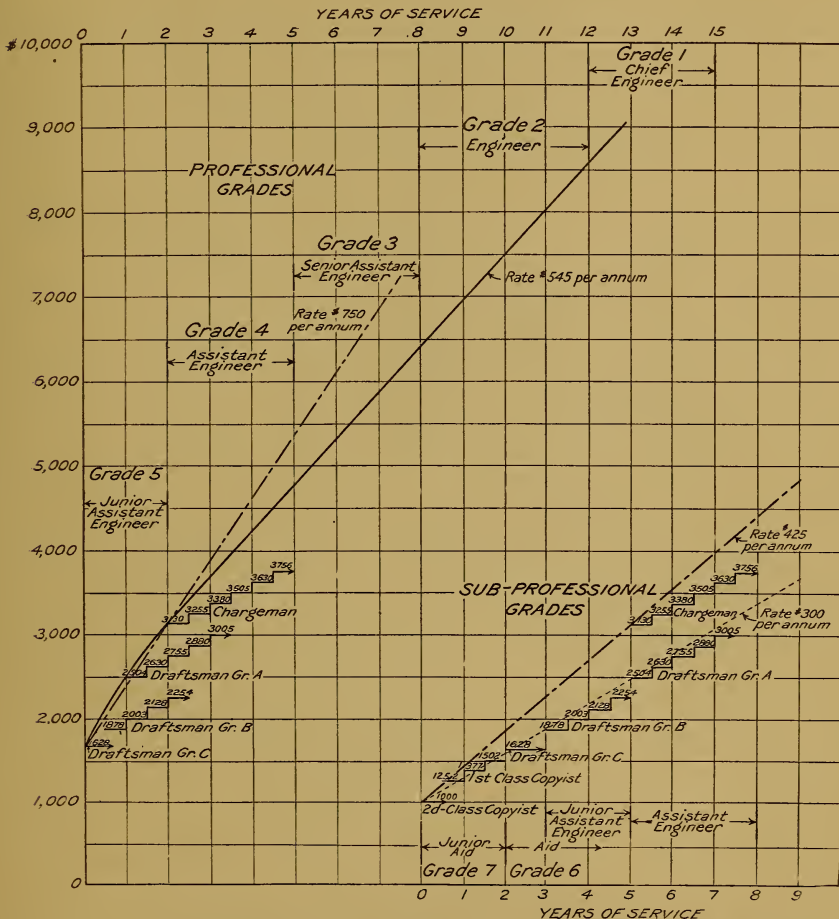


FIGURE 4.—Relation between recommended engineering grades and the "Macy Scale."

would not have materially differed in the requirements for these grades from those adopted by the committee. In fact, the Navy Department is now paying a rate of \$5,634 per annum in a grade that corresponds to the committee's "Senior Assistant Engineer," and from \$9,000 to \$10,000 in the grade corresponding to "Chief Engineer," both of which figures are approximately on the projected line of figure 4.

As a tentative proposal for discussion, the committee presents the salary curve of figure 5 built upon the same principles as the Macy scale and practically identical with it for the grades covered by both. As applied to positions in the Government service such a scale has the advantage of being an extension of a scale

already adopted and in use in Government work. It is believed, however, that it will be found equally applicable in State and municipal service and very probably in private employment also.

The schedules of figure 5 are constructed on the same principles as those on figure 4. On both, two schedules are given—a "professional," which presupposes an engineering degree or its equivalent, and a "sub-professional," which does not require such a degree. The minimum number of years of experience required for the several grades are as proposed in the committee's definitions of those grades. Of the two lines of maximum salary increase, the one for the sub-professional grades

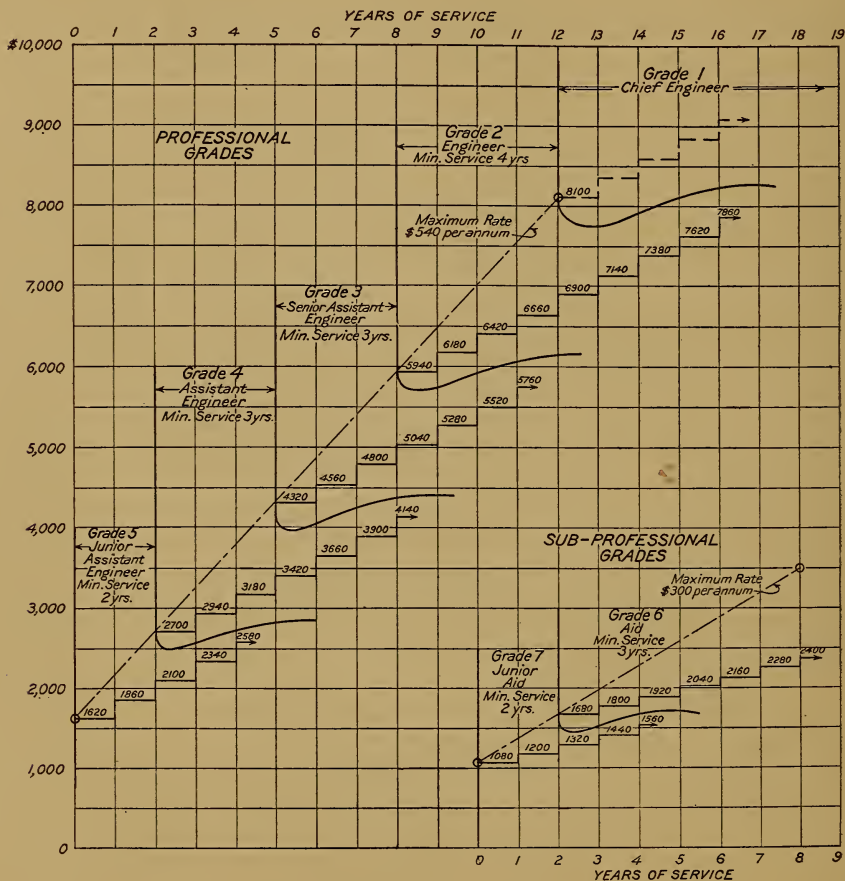


FIGURE 5.—Recommended salary schedule.

is identical with the general curve for such grades on the Macy scale, namely, \$300 a year. For the professional grades, a maximum rate of \$540 a year has been taken. This is slightly less than the lower of the two curves for the corresponding grades on the Macy scale. Furthermore, a straight line is used, which has the effect of dropping the entire line below the corresponding line on the Macy scale in an amount varying from \$8 a year at entrance to the junior grade to \$480 a year after 12 years of service.

The two dot and dash lines on the diagram represent the maximum rate of advancement through a period of years involving service in more than one grade. The normal rate within any one grade is represented by the solid stepped lines,

which indicate a normal annual advancement within the sub-professional grades of \$120 a year and within the professional grades of \$240 a year, as compared with \$250 a year in the Macy scale. In general, therefore, this schedule is somewhat less than the Macy scale.

The proposed application of the schedule is as follows: An individual entering the service as junior assistant engineer would receive the entrance salary of \$1,620. Annually the individuals in the grade of junior assistant engineer would be rated either as a whole or in groups by a method which would determine the relative standing of the individuals in the grade or group. The grade or group would then be divided into three sections on the basis of the relative standing as determined—the upper section to contain, say, the top one-fourth, the second section the middle one-half, and the third section the lowest one-fourth. The middle one-half would

Grade	Titles of Positions	Minimum Years of Service in Grade	Minimum Salary of Grade	Total Promotion in Grade, Number and Amount of Standard Annual Promotions	Maximum Salary of Grade	Total Promotion between Grades
PROFESSIONAL GRADES						
1	Chief Engineer	—	8100	→	and up	
				← 240		2160
2	Engineer	4	5940	{ 1920 } →	8 × 240	7860
				← 180		1620
3	Senior Assistant Engineer	3	4320	{ 1440 } →	6 × 240	5760
				← 180		1620
4	Assistant Engineer	3	2700	{ 1440 } →	6 × 240	4140
				← 120		1080
5	Junior Assistant Engineer	2	1620	{ 960 } →	4 × 240	2580
SUB-PROFESSIONAL GRADES						
6	Aid	3	1680	{ 720 } →	6 × 120	2400
				← 120		600
7	Junior Aid	2	1080	{ 480 } →	4 × 120	1560

TABLE 3.—Tentative recommended salary schedule.

then be given the normal salary advance of \$240 a year, the upper one-fourth twice the normal, or \$480, and the lowest one-fourth no advance. The average advance in the entire grade would be the normal of \$240. This plan differs from the Macy scale award in that the latter grants an automatic increase of \$250 a year to all persons in the grade. It is believed, however, that the plan proposed will provide a desirable spirit of competition, by making it to the pecuniary advantage of every individual to get into or remain in the highest section in his grade.

The normal salary scale for each grade is drawn up on the basis of a period of service in the grade of approximately twice the duration prescribed as a minimum for eligibility to a higher grade. This minimum period of service having expired, a qualified individual would be eligible for advancement into the next higher grade

whenever a vacancy occurs in that grade. Such vacancies should be filled by the promotion of the best man in the upper section of the grade, thus making provision whereby a person of exceptional ability could, through a period of years, advance at a rate greater than is shown by the individual grade scale. The practical application of this schedule will, of course, require an adequate personnel classification and a carefully worked out plan of rating the relative efficiency of individual employees.

Table 3 shows the proposed schedule in tabular form. Table 4 is a summary of the recommendations made in connection with the questionnaires submitted by the several bureaus. This table also shows the ratio of the recommended schedule to the existing schedules in civilian establishments and in the Navy Department.

The committee is collecting and studying additional data, particularly with respect to salaries paid in engineering positions in private employment, and will submit such data with its conclusions in its final report.

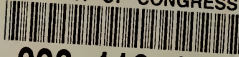
TABLE 4.—Average of salary schedule recommended by bureau chiefs.

Grade. (1)	No. of persons. (2)	Recommended pay per annum.			Present average 4 Engineering Bureaus in Navy Department. (6)	Present average 16 Engineering Bureaus in Civil Establishments. (7)	Ratio of Column 6 to Column 5. (8)	Ratio of Column 7 to Column 5. (9)
		*Maximum. (3)	*Minimum. (4)	Average. (5)				
1	15	\$9,750	\$8,600	\$9,175	\$9,450	\$5,867	103.0	63.9
2	83	6,780	5,610	6,040	6,381	3,801	113.9	67.9
3	209	5,280	3,980	4,600	4,312	3,104	93.7	67.5
4	846	3,820	3,040	3,400	3,600	2,222	105.9	65.4
5	1,353	3,240	2,260	2,720	2,818	1,719	103.6	63.2
6	1,092	2,750	1,620	2,060	1,954	1,293	94.8	62.7
7	169	1,500	900	1,340	1,379	975	102.6	72.5
8	189	7,140	3,000	4,220	2,717	1,812	64.4	42.9

* Average of amounts recommended by individual bureaus.

COMMITTEES

- Executive**—J. Parke Channing, Chairman; D. S. Jacobus, Charles S. Churchill, Comfort A. Adams, Philip N. Moore and Charles E. Skinner.
- Finance**—N. A. Carle, Chairman; Charles F. Loweth, Sidney J. Jennings and George J. Foran.
- Nominating**—Clemens Herschel, Chairman; George F. Kunz, Charles E. Skinner and Albert Ladd Colby.
- Rules**—J. Parke Channing, Chairman; Clemens Herschel, N. A. Carle and Irving E. Moulthrop.
- Advisory Committee to New York State Reconstruction Commission**—George W. Fuller, Chairman; H. deB. Parsons, George F. Kunz, Paul G. Brown and L. B. Stillwell.
- Americanization**—Alex. C. Humphreys, Chairman; Palmer C. Ricketts, Samuel Sheldon, W. F. M. Goss and Albert R. Ledoux.
- Classification and Compensation of Engineers**—Arthur S. Tuttle, Chairman; Francis Lee Stuart, John C. Hoyt, Charles Whiting Baker and M. O. Leighton.
- Curricula of Engineering Schools**—Alex. C. Humphreys, Chairman; D. S. Jacobus, Edwin Ludlow and Comfort A. Adams.
- Fuel Conservation**—L. P. Breckenridge, Chairman; Ozni P. Hood, Secretary; Robert H. Fernald, Charles R. Richards, Charles L. Edgar, Carl Scholz, David Moffat Myers, Edwin Ludlow and Harold W. Buck.
- International Affiliation of Engineers**—Charles F. Loweth, Chairman; H. C. Parmelee and Henry A. Lardner.
- License**—Theodore L. Condron, Chairman; Francis C. Shenehon, Farley Gannett, John H. Dunlap, Arthur M. Greene, Jr.; Caleb M. Saville, James H. Herron, A. M. Schoen, John Klorer, A. Lincoln Fellows, Amos Slater, C. H. Snyder, John W. Alvord, Bion J. Arnold and F. C. Woermann.
- National Service**—M. O. Leighton, Chairman; George F. Swain, C. B. Burdick, Philip N. Moore, L. D. Ricketts, Andrew M. Lockett, Andrew M. Hunt, W. C. L. Eglin, Bancroft Gherardi and Charles Whiting Baker, ex-officio.
- Patents**—Charles A. Terry, Chairman; C. A. P. Turner, Corydon T. Purdy, J. Parke Channing, Horace V. Winchell, Edwin J. Prindle, D. S. Jacobus and Frank N. Waterman.
- Public Affairs**—Charles Whiting Baker, Chairman; George F. Swain, Benjamin B. Thayer, Albert Ladd Colby and M. O. Leighton, ex-officio.
- Publicity**—James Owen, Chairman; W. W. Macon and J. G. Little.
- Publicity Methods**—J. Parke Channing, Chairman; Alfred D. Flinn, Lewis D. Rights, Bradley Stoughton, George A. Orrok, W. I. Slichter, C. L. Warwick.
- Reconstruction**—J. Parke Channing, Chairman; Harold W. Buck, George F. Swain, D. S. Jacobus, Calvert Townley and George J. Foran.
- Water Conservation**—Calvert Townley, Chairman; Charles T. Main, Allen Hazen, Arthur E. Morgan, M. O. Leighton, H. Hobart Porter and Arthur P. Davis.



ENGINEERING SOCIETIES EMPLOYMENT BUREAU

Directors—Calvin W. Rice, Chairman; Charles Warren Hunt, Bradley Stoughton, F. L. Hutchinson (secretaries of the Founder Societies). Walter V. Brown, Manager.

No charges for services. Personal attention to applications for men and positions. Engineers not members of a society represented in Engineering Council are required to present introductions from members.

FOUNDER SOCIETIES

By Founder Societies are meant American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and American Institute of Electrical Engineers, which founded United Engineering Society, Engineering Societies Library, Engineering Foundation and Engineering Council.

ADDRESSES

Addresses of representatives and of chairmen and members of committees can be found in the year-books of the member societies.